

**Final**

**Site-Specific Field Sampling Plan,  
Site-Specific Safety and Health Plan, and Site-Specific  
Unexploded Ordnance Safety Plan Attachments  
Former Range 41, Parcel 95Q and Impact Area, Choccolocco  
Corridor, Parcel 131Q-X**

**Fort McClellan  
Calhoun County, Alabama**

**Prepared for:**

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**Task Order CK10  
Contract No. DACA21-96-D-0018  
IT Project No. 796887**

**April 2002**

**Revision 0**

**Final**

**Site-Specific Field Sampling Plan**  
**Former Range 41, Parcel 95Q and Impact Area, Choccolocco**  
**Corridor, Parcel 131Q-X**

**Fort McClellan**  
**Calhoun County, Alabama**

**Task Order CK10**  
**Contract No. DACA21-96-D-0018**  
**IT Project No. 796887**

**April 2002**

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## ***List of Acronyms***

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See Attachment 1, List of Abbreviations and Acronyms.

## ***Executive Summary***

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In accordance with Contract Number DACA21-96-D-0018, Delivery Order CK10, IT Corporation (IT) will conduct site investigation activities at Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, at Fort McClellan, Calhoun County, Alabama, to determine the presence or absence of potential site-specific chemicals at the sites. The purpose of this site-specific field sampling plan (SFSP) is to provide technical guidance for sampling activities at these parcels.

Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, are located in training area 14G, east of Main Post in the Choccolocco Corridor. Choccolocco Corridor was leased from the State of Alabama by Fort McClellan for land navigation, military police driving, U.S. Army Chemical School training and bivouac area. The lease for Choccolocco Corridor was terminated in 1998.

Former Range 41, Parcel 95Q, is 8.5 acres in size. Former Range 41 was probably active during the 1960s and 1970s. The history of use for this range is unclear. The range appeared on 1966 and 1971 historical maps as Range 41, which would coincide with reports from long-time Fort McClellan personnel who indicate that this range was a small arms range during the Vietnam era. Direction of fire is believed to have been toward the west.

The archive search report (ASR) indicates that Former Range 41 was built during the Vietnam War, was listed as a Battle Drill & Assault Range, and probably did not include live fire. The ASR reports Former Range 41 as abandoned by 1974. Expended M-16 rifle blanks, smoke grenades, and 40mm TP Grenade cases were found on this range as indicated in the ASR.

Parcel 131Q-X is described as a former impact area within the Range 40 area. Parcel 131Q-X is 4.4 acres in size.

A site walk in the area of Parcel 95Q, by IT in December 2001 and January 2002, revealed that this area appears to have been used for training. Expended shell casings, numerous lead fragments, and evidence of 40mm target practice grenades, along with a 55-gallon drum (used for small arms target practice), and expended flares were observed during the site walks.

Specifically, IT will collect 12 surface soil samples, 12 subsurface soil samples, 4 groundwater samples, 3 surface water samples, 3 sediment samples, and 2 depositional soil samples at Former Range 41 and the Impact Area to meet the objectives of the site investigation. Potential contaminant sources at Former Range 41 and the Impact Area include explosives and lead (from expended bullets). Chemical analyses of the samples collected during the field program will include metals and explosives. Also, sediment samples will be analyzed for total organic carbon and grain size. Ten percent of the sample types will also be analyzed for volatile organic compounds, semivolatile organic compounds, chlorinated pesticides, organophosphorous pesticides, and chlorinated herbicides. Results from these analyses will be compared with site-specific screening levels, ecological screening values, and background values to determine if potential site-specific chemicals are present at the site at concentrations that pose an unacceptable risk to human health or the environment.

The presence of unexploded ordnance (UXO) is possible at Former Range 41 and the Impact Area, because they are within an area of former active ranges. Therefore, IT will conduct UXO avoidance activities as outlined in Appendix E of the installation-wide sampling and analysis plan (SAP) and the attached site-specific UXO safety plan prior to initiating field activities at this site. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

This SFSP attachment to the installation-wide SAP for Former Range 41 and the Impact Area will be used in conjunction with the site-specific safety and health plan (SSHP), site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, monitoring well installation and maintenance plan, waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the SSHP.

## **1.0 Project Description**

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### **1.1 Introduction**

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, under Delivery Order CK10, Contract Number DACA21-96-D-0018.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2002a) for FTMC has been prepared to provide technical guidance for sample collection and analysis at Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and site-specific unexploded ordnance (UXO) safety plan developed for Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, and the installation-wide work plan (WP) (IT, 2002a), and SAP. The SAP includes the installation-wide safety and health plan, well installation and maintenance plan, waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP and site-specific UXO safety plan.

### **1.2 Site Description**

Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, are located in training area 14G, east of Main Post in the Choccolocco Corridor (Figure 1-1). Choccolocco Corridor was leased from the State of Alabama by Fort McClellan for land navigation, military police driving, U.S. Army Chemical School training and bivouac area. The lease for Choccolocco Corridor was terminated in 1998.

Former Range 41, Parcel 95Q, is 8.5 acres in size. There are conflicting reports of the dates of use for Parcel 95Q, but the area was most likely active during the 1960s and 1970s. The history of use for Former Range 41 is unclear. The range appeared on 1966 and 1971 historical maps, which would coincide with reports from long-time Fort McClellan personnel who indicate that this range was a small arms range during the Vietnam era. Direction of fire is believed to have been toward the west (Environmental Science and Engineering Inc. [ESE], 1998).



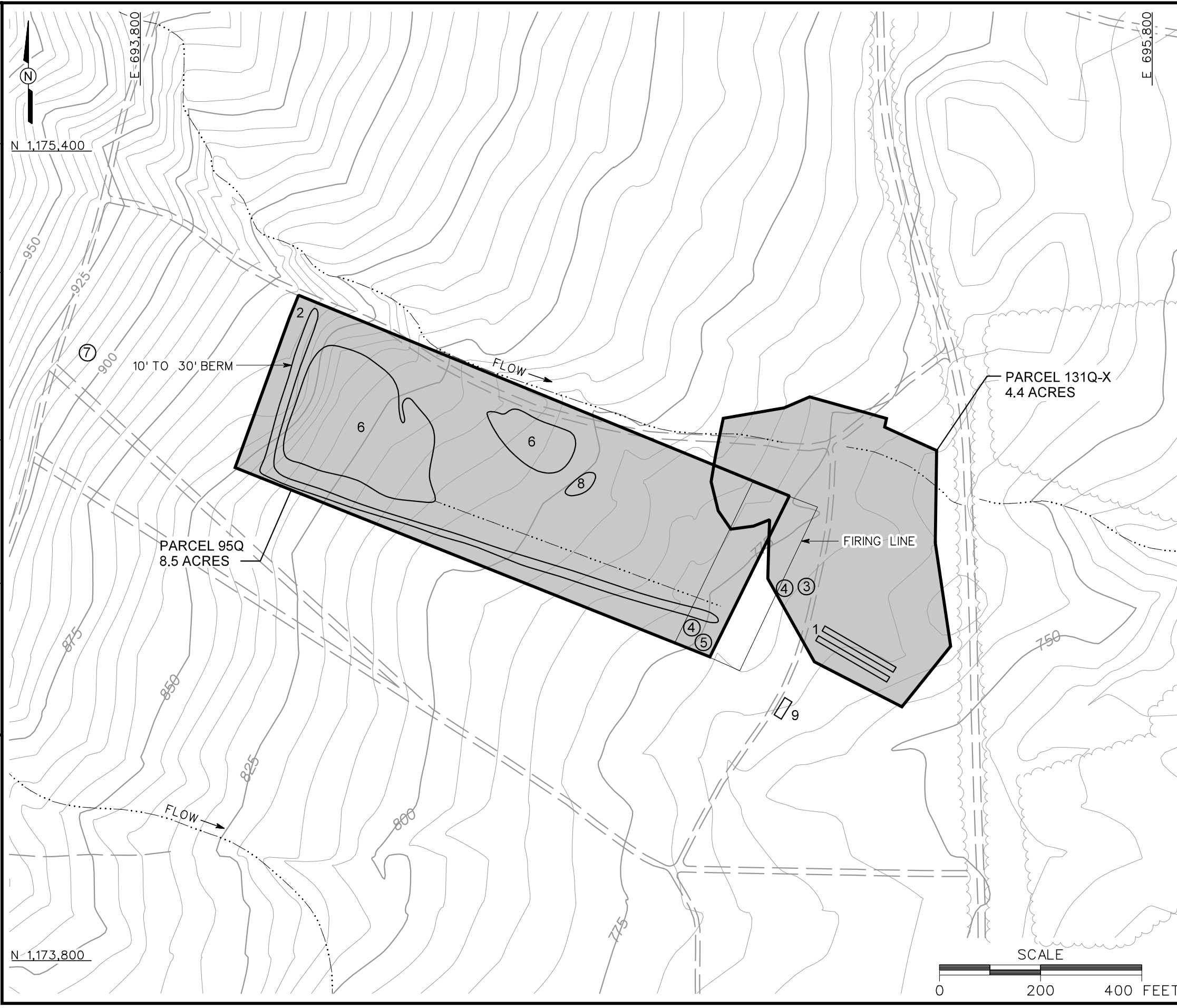
The archive search report (ASR) (USACE, 1999a) indicates that Former Range 41 was built during the Vietnam War, was listed as a Battle Drill & Assault Range, probably did not include live fire, and was abandoned by 1974. Expended M-16 rifle blanks, smoke grenades, and 40mm TP Grenade cases were found on this range as indicated in the ASR.

Parcel 131Q-X is described as a former impact area within the Range 40 area. Parcel 131Q-X is 4.4 acres in size (ESE, 1998).

Site walks by IT personnel conducted in December 2001 and January 2002 revealed that Former Range 41 appears to have been used for training. The most obvious feature noted during the site walk was a large berm, possibly a backstop, situated along the southwest and west Parcel boundaries (Figure 1-2). The berm was noted to range from 10 to 30 feet in height. Two cleared areas were found at the west end of Former Range 41 in front of the berm. In the open areas, vegetation was mostly young montane longleaf pine (*pinus palustris*). Expended shell casings and evidence of 40mm grenade firing was found in these cleared areas. To the south of the berm, in the southeast corner of Parcel 95Q, a depression (1 foot deep x 2 feet x 4 feet), a 55-gallon drum (used for small arms target practice), and expended flares were found. Within Parcel 131Q-X an observation tower was noted to the west of the road. A depression (1 foot deep x 2 feet x 4 feet) was found to the west of the observation tower. On the east side of the road, a 3 feet high berm adjacent and parallel to a 4 feet deep ditch was found running in a northwest-southeast direction. The fuselage of a helicopter was found to the west of Parcel 95Q; however, there was no evidence it had been used as a target. Remnants of a building with exposed electrical wiring were observed to the southeast of the parcels. It is possible that pop-up targets were controlled from this location. Areas to the south and west of the parcels, partially bounded by dirt roads, show evidence of having been recently logged.

### **1.2.1 Archive Search Report Ranges**

In addition to the environmental baseline survey (EBS), the USACE July 1999 *Archives Search Report (ASR), Maps, Fort McClellan, Anniston, Alabama* (USACE, 1999a) was researched for information about Former Range 41 and the Impact Area. Plate 6 (1950 to 1973 Range Use) of the ASR shows one range (Range 41) overlapping the area of investigation (Figure 1-3). The ASR location of Former Range 41 differs slightly from the range location presented in the EBS. This is the only time period that Former Range 41 is shown on the plates in the ASR. The Impact Area is not noted on any of the ASR Plates.



**LEGEND**

UNIMPROVED ROADS AND PARKING

PAVED ROADS AND PARKING

TOPOGRAPHIC CONTOURS  
(CONTOUR INTERVAL - 5 FOOT)

TREES / TREELINE

PARCEL BOUNDARY

FIRING LINE

SURFACE DRAINAGE / CREEK

**TRAINING AIDS/PHYSICAL FEATURES OBSERVED**

① DITCH AND BERM

② IMPACT BERM / BACKSTOP

③ OBSERVATION TOWER

④ DEPRESSION

⑤ 50-GALLON DRUM AND EXPENDED FLARES

⑥ CLEARED AREA, MANY EXPENDED SHELL CASINGS AND 40mm TARGET GRENADE FRAGMENTS

⑦ HELICOPTER

⑧ WHITE 5-GALLON STEEL BUCKET

⑨ BUILDING REMNANTS

**FIGURE 1-2**

**SITE MAP**

**FORMER RANGE 41, PARCEL 95Q**

**IMPACT AREA, CHOCCOLOCCO**

**CORRIDOR, PARCEL 131Q-X**

U. S. ARMY CORPS OF ENGINEERS

MOBILE DISTRICT

FORT McCLELLAN

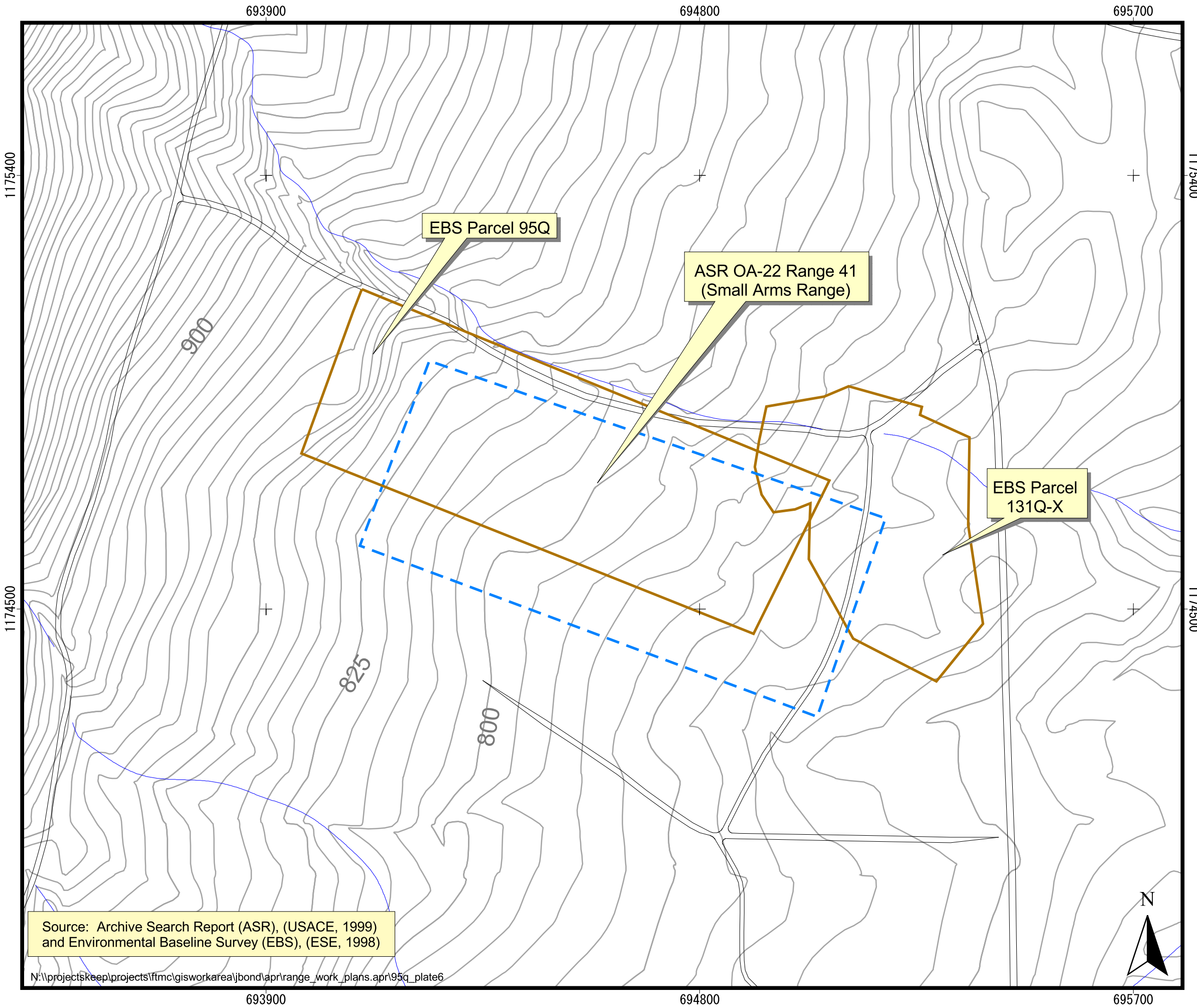
CALHOUN COUNTY, ALABAMA

Contract No. DACA21-96-D-0018

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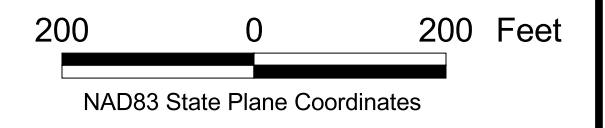
# Figure 1-3

## ASR Plate 6 (1950 to 1973) Range Location Map

Former Range 41, Parcel 95Q  
and Impact Area, Choccolocco  
Corridor, Parcel 131Q-X  
Fort McClellan, Alabama

### Legend

- EBS Parcel
- ASR OA-22 Range 41 (Small Arms Range)
- Roads
- Streams
- Topographic Contours 5-foot Interval



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Mobile District



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### **1.2.2 Aerial Photographs**

Available aerial photographs were reviewed to reveal any land-use activity in the area of investigation. The following is a review of the available aerial photographs.

**1937 and 1940, September.** The area of investigation is mostly forested; however, there is an area at the western corner of Former Range 41 that has been cleared. A large portion of the Impact Area is also cleared.

**1954.** The area of investigation is forested.

**1969.** Former Range 41 has been cleared (Figure 1-4). A berm (noted during the December 2001 IT site-walk) along the southwest and west boundaries of the parcel, is evident on the aerial photograph, as are some possible targets located approximately three-fourths the length of the parcel to the west. Part of the Impact Area appears to have been cleared and it is possible to see an object in the location of the observation tower noted on the December 2001 IT site-walk.

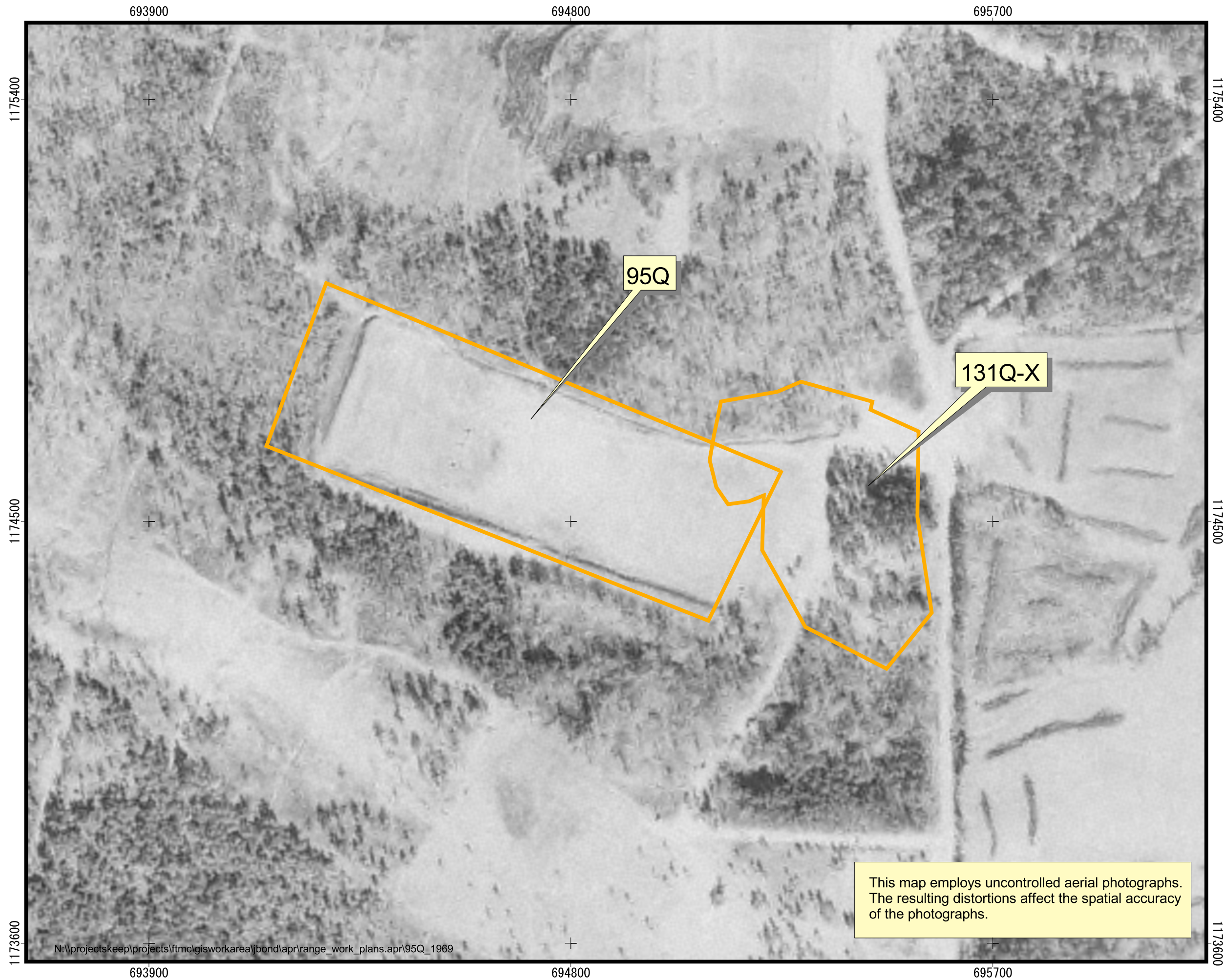
**1976.** Former Range 41 is still predominately cleared, although it appears that the eastern portion may have some regrowth. The berm is still visible. The part of the Impact Area that was cleared in the 1969 photograph also appears to be revegetating.

**1982.** Former Range 41 is partially wooded, and the Impact Area is completely wooded. Two areas of Former Range 41, located at the western end, and approximately halfway along the northern parcel boundary are still cleared. These are the same areas that, during the December 2001 IT site walk, were found to still be cleared and contain the most lead debris. The berm is still visible in the photograph.

**1994.** The Impact Area is fully wooded (Figure 1-5). Former Range 41 is unchanged from the 1982 aerial photograph. The berm is still visible.

**1998.** The Impact Area and Former Range 41 are unchanged from the 1994 aerial photograph (Figure 1-6).






# Figure 1-4

## 1969 Aerial Photograph

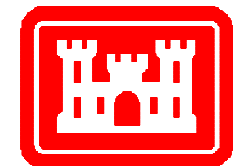
Former Range 41,  
Parcel 95Q and Impact  
Area, Choccolocco  
Corridor, Parcel 131Q-X  
Fort McClellan, AL

### Legend

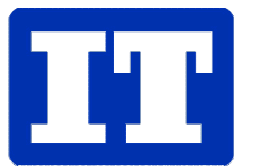
 Area of Investigation/  
Parcel Boundary

0 200 Feet

NAD83 State Plane Coordinates



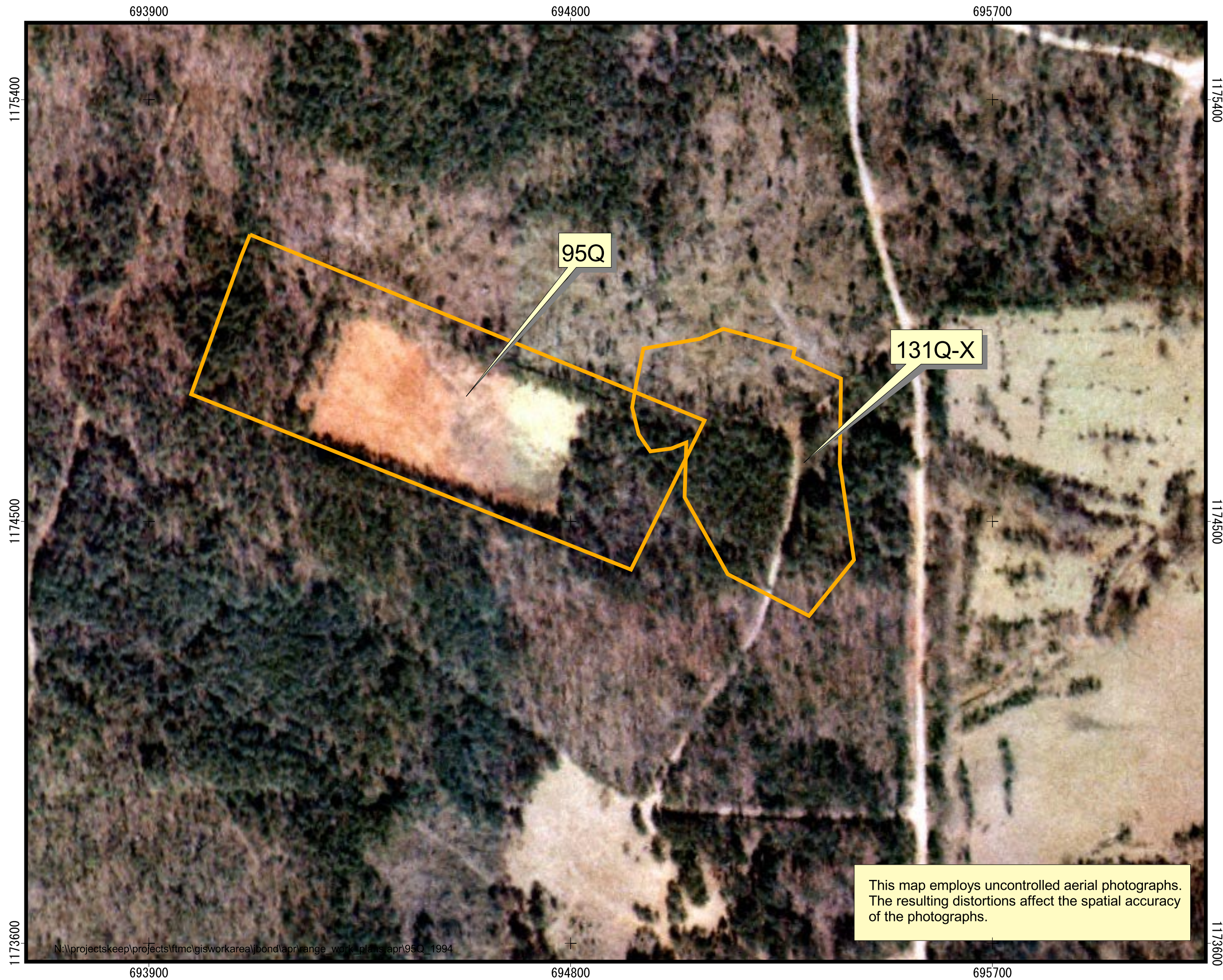
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# Figure 1-5

## 1994 Aerial Photograph

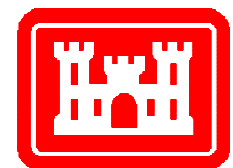
Former Range 41,  
Parcel 95Q and Impact  
Area, Choccolocco  
Corridor, Parcel 131Q-X  
Fort McClellan, AL

### Legend

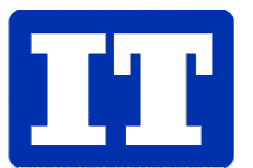
 Area of Investigation/  
Parcel Boundary

0 200 Feet

NAD83 State Plane Coordinates



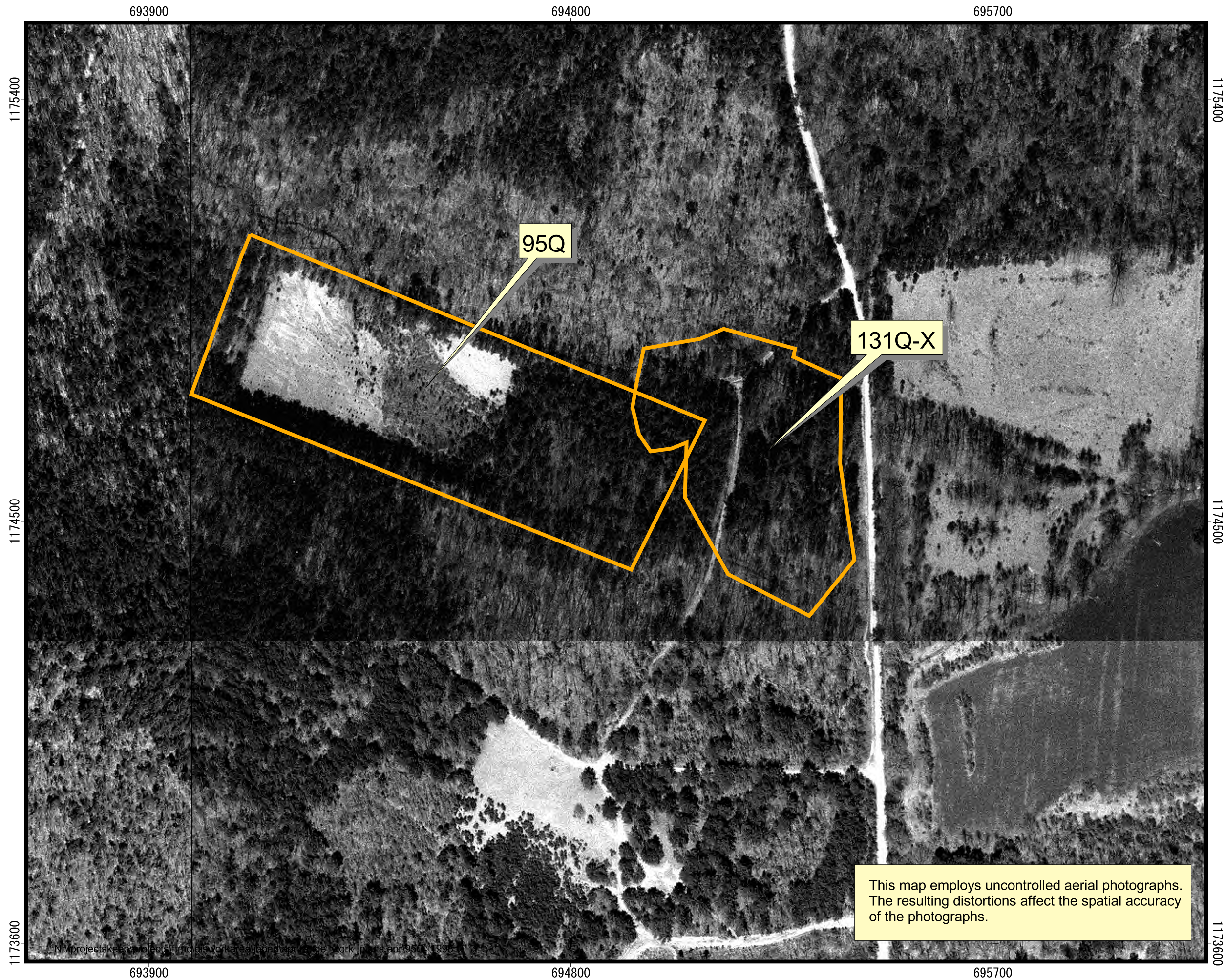
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# Figure 1-6

## 1998 Aerial Photograph

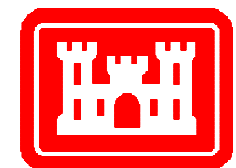
Former Range 41,  
Parcel 95Q and Impact  
Area, Choccolocco  
Corridor, Parcel 131Q-X  
Fort McClellan, AL

### Legend

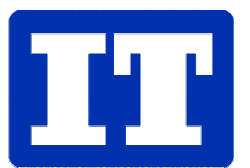
 Area of Investigation/  
Parcel Boundary

0 200 Feet

NAD83 State Plane Coordinates



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### **1.2.3 Soil Types**

The soils at Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X, consist of Anniston and Allen gravelly loams; Jefferson gravelly fine sandy loam; and Phil and Stendal soils, local alluvium (U.S. Department of Agriculture [USDA], 1961).

The Anniston and Allen gravelly loam consists of deep, strongly acid, well drained soils that have developed in old alluvium. The parent material washed from adjacent, higher lying soils, which developed from weathered sandstone, shale and quartzite. The surface horizon of the Anniston and Allen gravelly loam is very dark to dark grayish-brown fine sandy loam or loam. The subsoil is dark-red fine sandy clay loam. Fragments of sandstone and quartzite are found on the surface and throughout the soil. They are found on foot slopes and colluvial fans (USDA, 1961).

The Jefferson gravelly fine sandy loam soil consists of well-drained, strongly acidic soils that occur in small areas on fans and foot slopes. These soils have developed from old local alluvium that washed or sloughed from ridges of sandstone, shale, and Weisner quartzite. The surface soil is dark grayish-brown fine sandy loam, and the subsoil is yellowish-brown, light fine sandy clay. Fragments of sandstone and quartzite are found on the surface and throughout the soil (USDA, 1961).

The Phil and Stendal soils, local alluvium occurs in areas 1 to 10 acres in size on footslopes, and along and at the heads of small drainageways. The soils are variable in color, texture, and consistency, but generally the surface soils are dark grayish-brown to dark-brown fine sandy loam; and the subsoil is dark-brown, slightly mottled fine sandy loam. The parent material washed mainly from sandstone and shale, but some originated from limestone. The drainage ranges from somewhat poor to moderately good (USDA, 1961)

### **1.3 Scope of Work**

The scope of work for activities associated with the SI at Former Range 41 and the Impact Area, as specified by the statement of work (USACE, 1999b), includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Develop the site-specific UXO safety plan attachment.

- Conduct a surface and near-surface UXO survey over all areas to be included in this sampling effort.
- Provide downhole UXO support for all drilling to determine buried downhole hazards.
- Collect 12 surface soil samples, 12 subsurface soil samples, 4 groundwater samples, 3 surface water samples, 3 sediment samples, and 2 depositional soil samples at Former Range 41 and the Impact Area to determine whether potential site-specific chemicals (PSSC) are present at the site and to provide data useful for supporting any future planned corrective measures and closure activities.
- Analyze samples for the parameters listed in Section 4.5.

The possibility for UXO exists at Former Range 41 and the Impact Area; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at both parcels. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance. The site-specific UXO safety plan will be used to support sample collection activities at Former Range 41 and the Impact Area should incidental ordnance, explosive, and UXO be encountered and require avoidance.

At completion of the field activities and sample analyses, an SI report will be prepared to summarize the results of the activities, to evaluate the absence or presence of PSSCs at this site, and to recommend further actions, if appropriate. SI reports will be prepared in accordance with current U.S. Environmental Protection Agency (EPA), Region IV and the Alabama Department of Environmental Management (ADEM) guidelines.

## ***2.0 Summary of Existing Environmental Studies***

---

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by the following seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)
2. Areas where only release or disposal of petroleum products has occurred
3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken
5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented
7. Areas that are not evaluated or require further evaluation.

For non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified Parcel, and the code for the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)
- RD = Radionuclides/radiological issues



- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with the CERFA (CERFA-Public Law 102-426) protocols and U.S. Department of Defense policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Former Range 41 and the Impact Area were identified as Category 1 CERFA sites. Category 1 sites are areas where no known or recorded storage, release, or disposal (including migration) has occurred on site property. The Impact Area is also assigned a UXO qualifier (X) because of the potential for UXO. Former Range 41 and the Impact Area require additional evaluation to determine the environmental condition of the parcels.

## **3.0 Site-Specific Data Quality Objectives**

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### **3.1 Overview**

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X. This section incorporates the components of the DQO process described in the publication EPA 600/R-96/005 *Guidance for the Data Quality Objectives Process* (EPA, 2000). The DQO process as applied to Former Range 41 and the Impact Area is described in more detail in Section 3.4 of this SFSP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, and the procedures necessary to meet the objectives of the SI and establish a basis for future action at this site.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 of this SFSP and Chapter 5.0 of the QAP. Data will be reported and evaluated in accordance with definitive data requirements of Chapter 2, *Chemistry Data Reporting Requirements and Data Package Deliverables*, USACE Engineer Manual 200-1-6, *Chemical Quality Assurance Plan For Hazardous, Toxic and Radioactive Waste (HTRW) Projects* (USACE, 1997) and evaluated by the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP). Chemical data will be reported by the laboratory via hard copy data packages (using Contract Laboratory Program-like forms) and electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

### **3.2 Data Users and Available Data**

The available data related to the SI at Former Range 41 and the Impact Area presented in Table 3-1, has been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

**Summary of Data Quality Objectives**  
**Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**  
**Site Investigation**  
**Fort McClellan, Calhoun County, Alabama**

Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation, other contractors, and possible future land users	None	<u>Contaminant Source</u> Parcels 95Q and 131Q-X (explosives and metals)	<u>Surface soil</u>	SI to confirm the presence or absence of contamination in the site media	<u>Surface soil</u> TAL Metals, Nitroaromatic and Nitramine Explosives; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	12 surface soil samples + QC
		<u>Migration Pathways</u> Rain runoff and erosion to surface soil, infiltration and leaching to subsurface soil and groundwater, dust emissions and volatilization to ambient air, and biotransfer to venison, groundwater discharge to surface water, and surface water and erosion to sediment.	<u>Subsurface Soil</u>		<u>Subsurface Soil</u> TAL Metals, Nitroaromatic and Nitramine Explosives; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	12 subsurface soil samples + QC
		<u>Potential Receptors</u> Recreational site user (current and future) Resident (future)	<u>Groundwater</u>	Definitive quality data for future decision- making	<u>Groundwater</u> TAL Metals, Nitroaromatic and Nitramine Explosives; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	4 groundwater samples + QC
			<u>Surface Water</u>		<u>Surface Water</u> TAL Metals, Nitroaromatic and Nitramine Explosives; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	3 surface water samples + QC
			<u>Sediment</u>		<u>Sediment</u> TAL Metals, Nitroaromatic and Nitramine Explosives, TOC and Grain Size; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	3 sediment samples + QC
			<u>Depositional soil</u>		<u>Depositional Soil</u> TAL Metals, Nitroaromatic and Nitramine Explosives; Plus 10% of Samples for TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides	Definitive data in data packages (as defined in USACE EM200-1-6)	2 depositional soil samples + QC
		<u>PSSC</u> metals, nitroexplosives, VOCs, SVOCs, herbicides, and pesticides					

ADEM - Alabama Department of Environmental Management.

CI - Chlorinated.

DOD - U.S. Department of Defense.

EM200-1-6 - USACE Engineering Manual, *Chemical Quality Assurance for HTRW Projects*, October 10, 1997.

EPA - U.S. Environmental Protection Agency.

FTMC - Fort McClellan.

OP - Organophosphorous.

PSSC - Potential site-specific chemical.

QC - Quality control.

SI - Site investigation.

SVOCs - semivolatile organic compounds.

TAL - Target analyte list.

TCL - Target compound list.

TOC - Total organic carbon.

USACE - U.S. Army Corps of Engineers.

VOCs - volatile organic compounds.

### **3.3 Conceptual Site Exposure Model**

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks to human health in the risk assessment. The CSEM includes all receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates consistent and comprehensive evaluation of risk to human health through graphically presenting all possible exposure pathways, including all sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact scenarios with a contaminated source medium.

Primary contaminant release mechanisms were associated with training exercises (e.g., discharging lead and ordnance to the ground), and possibly through leaks and spills. Potential contaminant transport pathways include rain runoff and erosion to surface soil, infiltration and leaching to subsurface soil and groundwater, dust emissions and volatilization to ambient air, biotransfer to deer through browsing, groundwater discharge to surface water, and surface water runoff and erosion to sediment.

The site is believed to have been used as a small arms range. Most of the land within the subject parcels is tree covered and is currently not used by base personnel. However, because the site is not fenced and is wooded, it is accessible to potential trespassers who may hunt. Therefore, the most likely current receptor scenario for the site is a recreational site user who hunts.

Intermittent streams are present within the subject parcels; however, because this site does not have surface water year round, there is not sufficient surface water to contain fish for consumption. Potential receptor scenarios considered, but not included under current land-use scenarios, are as follows:

- **Groundskeeper.** The site is not currently maintained by a groundskeeper.
- **Construction Worker.** The site is unused, and no development or construction is occurring.

- **Resident.** The site is not currently used for residential purposes.

Future land use at Former Range 41 and the Impact Area is shown as part of the remediation reserve to be used for passive recreation. The sites may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). Potential receptor scenarios evaluated for the future include the following:

- **Recreational Site User.** Because the future site is planned for passive recreational use, and hunting is a viable option, the recreational site user is included. Fish ingestion will not be evaluated because the streams are too small to support fish for consumption.
- **Resident.** Although the site is not expected to be utilized for residential purposes, the resident is considered in order to provide information for the project manager and regulators.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

### **3.4 Decision-Making Process, Data Uses, and Needs**

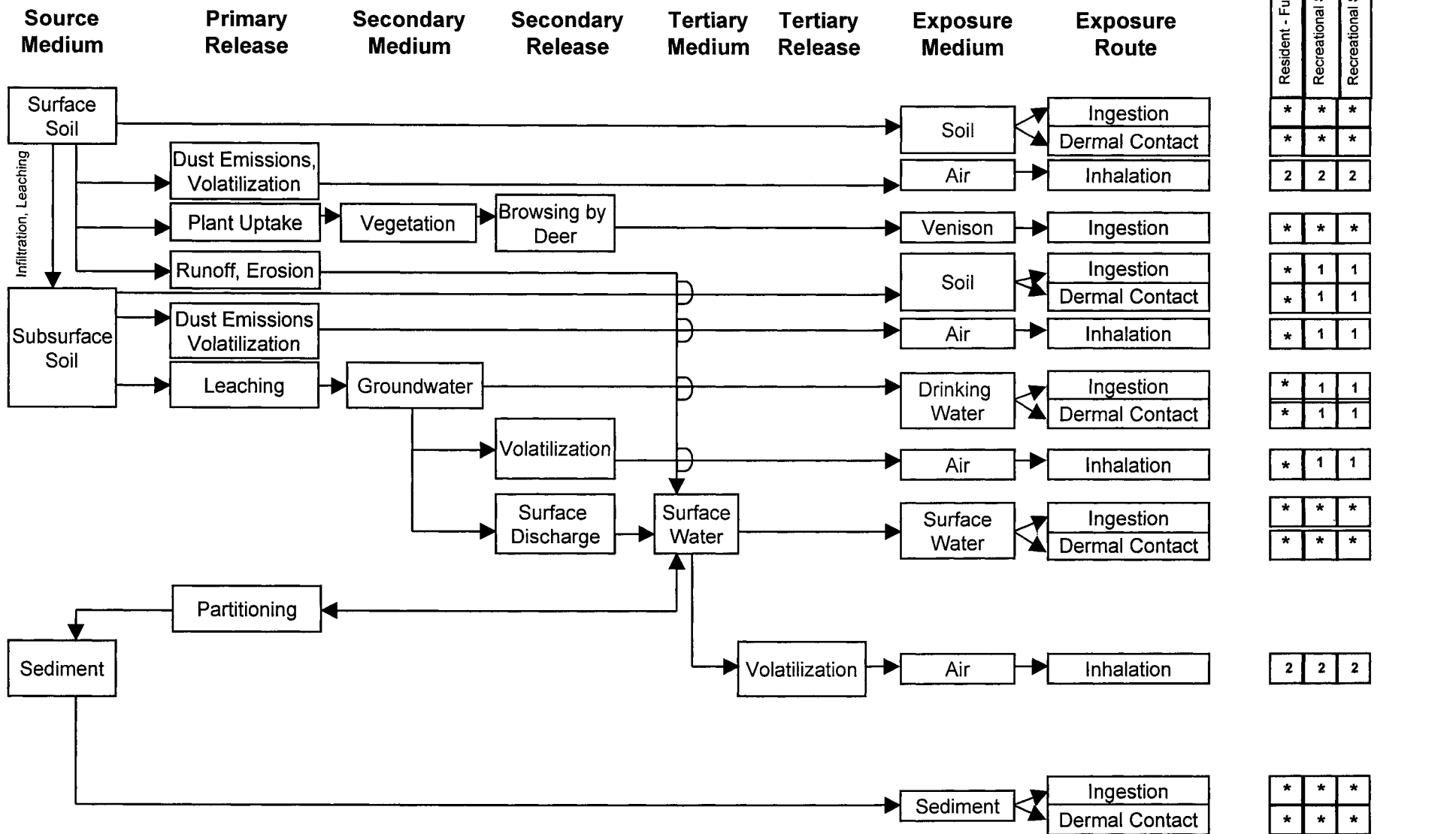
The seven-stage data quality objective decision-making process is presented in detail in Chapter 3.0 of the QAP and will be followed during the SI at Former Range 41 and the Impact Area. Data uses and needs are summarized in Table 3-1.

#### **3.4.1 Risk Evaluation**

Confirmation of contamination at Former Range 41 and the Impact Area will be based on comparing detected site chemicals of potential concern to site-specific screening levels, ecological screening values, and background values to determine if PSSCs are present at the site at concentrations that pose an unacceptable risk to human health or the environment. Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in Section 5.3 of the WP (IT, 2002b).

**Figure 3-1**  
**Human Health Conceptual Site Exposure Model**  
**Former Range 41, Parcel 95Q and Impact Area, Choccolocco Corridor, Parcel 131Q-X**  
**Fort McClellan, Alabama**



\* = Complete exposure pathway evaluated in the streamlined risk assessment.  
 1 = Incomplete exposure pathway.  
 2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

### ***3.4.2 Data Types and Quality***

Surface soil, subsurface soil, groundwater, surface water, sediment, and depositional soil samples will be sampled and analyzed to meet the objectives of the SI at Former Range 41 and the Impact Area. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard copy data packages. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of site characterization, remedial investigation, and risk assessment.

### ***3.4.3 Precision, Accuracy, and Completeness***

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 3.3 and presented in Chapter 5.0 of the QAP (IT, 2002a).

## **4.0 Field Activities**

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### **4.1 UXO Survey Requirements and Utility Clearances**

Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X are presumed to have been used for small arms training, therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings. The site-specific UXO safety plan provides technical guidance for ordnance and explosives avoidance for sample collection activities at Former Range 41 and the Impact Area. The site-specific UXO safety plan attachment has been written in conjunction with Appendix E of the SAP (IT, 2002a).

#### **4.1.1 Surface UXO Survey**

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Hand-held, low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for each avoidance. Subsurface metallic anomalies will not be disturbed, but will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Appendix E of the SAP (IT, 2002a).

#### **4.1.2 Downhole UXO Survey**

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Appendix E of the SAP (IT, 2002a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet below ground surface (bgs), whichever is reached first.

#### **4.1.3 Utility Clearances**

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the local utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.



## **4.2 Environmental Sampling**

The environmental sampling program at Former Range 41 and the Impact Area includes the collection of surface soil, subsurface soil, groundwater, surface water, sediment, and depositional soil samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted there. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the site.

### **4.2.1 Surface Soil Sampling**

Surface soil samples will be collected from 12 locations at Former Range 41 and the Impact Area, Choccolocco Corridor, Parcel 131Q-X.

#### **4.2.1.1 Sample Locations and Rationale**

The surface soil sampling rationale is listed in Table 4-1. Proposed sampling locations are shown on Figure 4-1. Surface soil sample designations, QA/QC sample requirements, and analytical parameters are summarized in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

#### **4.2.1.2 Sample Collection**

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 5.1.1.1 and Section 6.1.1.1 of the SAP (IT, 2002a). In areas where site access does not permit the use of a direct-push rig, the samples will be collected using a stainless steel hand auger as specified in Section 5.1.1.2 and Section 6.1.1.1 of the SAP (IT, 2002a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 6.8.3 of the SAP. Surface soil samples will be screened for information purposes only, not to aid in the selection of samples for analysis. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP. Sample documentation and chain-of-custody (COC) will be recorded as specified in Chapter 6.0 of the SAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

### **4.2.2 Subsurface Soil Sampling**

Subsurface soil samples will be collected from the 12 borings installed at Former Range 41 and the Impact Area.

Table 4-1

**Sampling Locations and Rationale**  
**Site Investigation**  
**Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**  
**Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Parcel	Sample Location	Sample Media	Sample Location Rationale
95Q	HR-95Q-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be located in the western portion of Parcel 95Q, downslope from the impact berm/backstop, within a cleared area at this site. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-95Q-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be located in the north central area of Parcel 95Q, within a cleared area at this site. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-95Q-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be located in the east end of Parcel 95Q, downslope from the majority of the parcel. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-95Q-GP01	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located on the impact berm/backstop near the upper northwestern boundary of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-GP02	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located on the impact berm/backstop near the northwestern boundary of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-GP03	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located on the impact berm/backstop near the lower northwestern boundary of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-GP04	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located downslope of the impact berm/backstop in a cleared area in the northwestern area of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-GP05	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located adjacent and downslope of the 10-30 foot berm along the southern boundary of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.

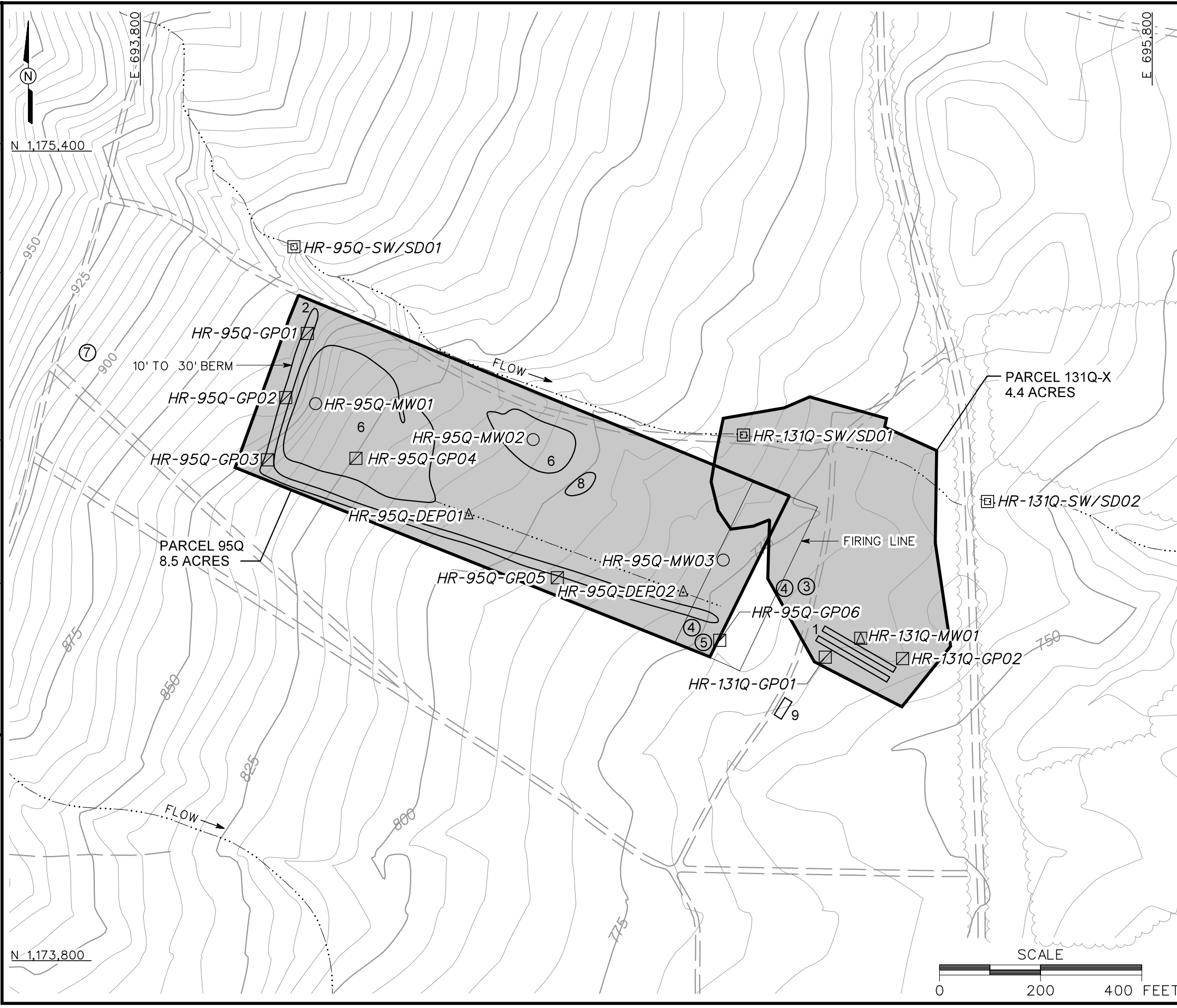
Table 4-1

**Sampling Locations and Rationale**  
**Site Investigation**  
**Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**  
**Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Parcel	Sample Location	Sample Media	Sample Location Rationale
95Q	HR-95Q-GP06	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located downslope of a 55-gallon drum and depressions in the southeastern corner of Parcel 95Q. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-SW/SD01	Surface water and sediment	Surface water and sediment samples to be collected northwest of the Parcel 95Q from the intermittent stream that flows southeast along and just outside the northern boundary of the parcel. Samples will be collected upslope of the parcel from the surface drainage/creek to determine if PSSC are present. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
	HR-95Q-DEP01	Depositional soil	Depositional soil will be collected from the natural drainage that flows southeast across the southern area of the parcel. Sample to be collected downslope from the impact berm/backstop and cleared area to determine if PSSC are present. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-95Q-DEP02	Depositional soil	Depositional soil will be collected near the southeastern corner of the parcel from the natural drainage that flows southeast across the southern area of the parcel. Sample to be collected downslope from the impact berm/backstop and cleared area to determine if PSSC are present. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
131Q-X	HR-131Q-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface soil, subsurface soil and groundwater samples to be located in the southern area of Parcel 131Q-X, adjacent to a berm and ditch. Sample data will indicate if contaminant releases into the environment have occurred from the use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction, site-specific geology and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
	HR-131Q-GP01	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located downslope of the northern ends of the berm and ditch in the southern area of Parcel 131Q-X. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the location for food and/or habitat purposes.
	HR-131Q-GP02	Surface soil and subsurface soil	Soil boring for surface and subsurface soil samples only. This boring is located adjacent to the southern end of the berm and ditch in the southern area of Parcel 131Q-X. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soils exist at this location.
	HR-131Q-SW/SD01	Surface water and sediment	Surface water and sediment samples to be collected in the northwest area of Parcel 131Q-X from the intermittent stream that flows along the northern boundary. Sample will be collected upslope of the majority of the parcel to determine if PSSC are present. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
	HR-131Q-SW/SD02	Surface water and sediment	Surface water and sediment samples to be collected east of the Parcel 131Q-X boundary from the intermittent stream that flows along the northern boundary. Samples to be collected downslope of the parcel to determine if PSSC are present. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.

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**LEGEND**

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION
- PROPOSED DEPOSITIONAL SOIL SAMPLE LOCATION

- TRAINING AIDS/PHYSICAL FEATURES OBSERVED**
- ① DITCH AND BERM
  - ② IMPACT BERM / BACKSTOP
  - ③ OBSERVATION TOWER
  - ④ DEPRESSION
  - ⑤ 55-GALLON DRUM AND EXPENDED FLARES
  - ⑥ CLEARED AREA, MANY EXPENDED SHELL CASINGS AND 40mm TARGET GRENADE FRAGMENTS
  - ⑦ HELICOPTER
  - ⑧ WHITE 5-GALLON STEEL BUCKET
  - ⑨ BUILDING REMNANTS

**FIGURE 4-1**  
**PROPOSED SAMPLE LOCATION MAP**  
**FORMER RANGE 41, PARCEL 95Q**  
**IMPACT AREA, CHOCCOLOCCO**  
**CORRIDOR, PARCEL 131Q-X**

Table 4-2

**Surface Soil, Subsurface Soil, and Depositional Soil Designations and QA/QC Sample Quantities,  
Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**

(Page 1 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
HR-95Q-GP01	HR-95Q-GP01-SS-QW0001-REG	0-1	HR-95Q-GP01-SS-QW0002-FD	HR-95Q-GP01-SS-QW0001-MS/MSD	TAL Metals, Nitroaromatic/Nitramine Explosives TCL VOCs, TCL SVOCs, CL Pesticides, OP Pesticides, and CL Herbicides
	HR-95Q-GP01-DS-QW0003-REG	2-4			
HR-95Q-GP02	HR-95Q-GP02-SS-QW0004-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-GP02-DS-QW0005-REG	2-4			
HR-95Q-GP03	HR-95Q-GP03-SS-QW0006-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-GP03-DS-QW0007-REG	2-4			
HR-95Q-GP04	HR-95Q-GP04-SS-QW0008-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-GP04-DS-QW0009-REG	2-4			
HR-95Q-GP05	HR-95Q-GP05-SS-QW0010-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-GP05-DS-QW0011-REG	2-4			
HR-95Q-GP06	HR-95Q-GP06-SS-QW0012-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-GP06-DS-QW0013-REG	2-4			
HR-95Q-MW01	HR-95Q-MW01-SS-QW0014-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-MW01-DS-QW0015-REG	2-4			
HR-95Q-MW02	HR-95Q-MW02-SS-QW0016-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-MW02-DS-QW0017-REG	2-4			
HR-95Q-MW03	HR-95Q-MW03-SS-QW0018-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-95Q-MW03-DS-QW0019-REG	2-4			

Table 4-2

**Surface Soil, Subsurface Soil, and Depositional Soil Designations and QA/QC Sample Quantities,  
Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**

(Page 2 of 2)

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
HR-95Q-DEP01	HR-95Q-DEP01-DEP-QW0020-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives TCL VOCs, TCL SVOCs, Cl Pesticides, OP Pesticides, and CL Herbicides
HR-95Q-DEP02	HR-95Q-DEP02-DEP-QW0021-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
HR-131Q-GP01	HR-131Q-GP01-SS-QY0001-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-131Q-GP01-DS-QY0002-REG	2-4			
HR-131Q-GP02	HR-131Q-GP02-SS-QY0003-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-131Q-GP02-DS-QY0004-REG	2-4			
HR-131Q-MW01	HR-131Q-MW01-SS-QY0005-REG	0-1			TAL Metals, Nitroaromatic/Nitramine Explosives
	HR-131Q-MW01-DS-QY0006-REG	2-4	HR-131Q-MW01-DS-QY0007-FD	HR-131Q-MW01-DS-QY0006-MS/MSD	

Cl - Chlorinated

FD - Field duplicate.

MS/MSD - Matrix spike/matrix spike duplicate.

OP - Organophosphorous

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOCs - Semivolatile organic compounds.

TAL - Target analyte list.

TCL - Target compound list.

VOCs - Volatile organic compounds.

#### **4.2.2.1 Sample Locations and Rationale**

Subsurface soil samples will be collected from the proposed soil borings shown on Figure 4-1. The subsurface soil sampling rationale is listed in Table 4-1. Subsurface soil sample designations and analytical parameters are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

#### **4.2.2.2 Sample Collection**

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot bgs in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 5.1.1.1 and Section 6.1.1.1 of the SAP (IT, 2002a). In areas where site access does not permit the use of a direct-push rig, the samples will be collected using a hand-auger as specified in Section 5.1.1.2 and Section 6.1.1.1 of the SAP (IT, 2002a).

Soil samples will be collected continuously for the first 4 feet or until either groundwater or refusal is reached. A detailed lithological log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analysis. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 6.8.3 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analysis. Subsurface soil samples may be selected for analysis from any depth interval if the on-site geologist suspects PSSCs at that interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analysis. More than one subsurface soil sample will be collected if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and chain-of-custodies will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Chapter 4.0 and listed in Table 4-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

### **4.2.3 Permanent Residuum Monitoring Wells**

Four permanent residuum monitoring wells will be installed at Former Range 41 and the Impact Area. The permanent residuum monitoring well locations are shown on Figure 4-1. The rationale for each monitoring well location is presented in Table 4-1. The monitoring well boreholes will be drilled to the top of bedrock, or until adequate groundwater is encountered to install a well with a 10- to 20-foot screen. Monitoring wells will be installed using a truck-mounted or all terrain vehicle hollow-stem auger drill rig. The monitoring well casing will consist of new 2-inch inside-diameter (ID), Schedule 40, threaded, flush-joint polyvinyl chloride (PVC) pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap PVC well screen, approximately 10 to 20 feet long.

At the discretion of the IT site manager, a sump (composed of new, 2-inch ID, schedule 40, threaded, flush-joint PVC) may be attached to the bottom of the well screen. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. In wells installed to depths of 20 feet or less, the filter pack material may be gravity filled. In wells installed to depths of 20 feet or more, the filter pack will be tremied into place. The filter pack will be installed from the bottom of the well to approximately five feet above the top of the well screen. The filter pack will consist of 20/40 silica sand. A fine sand (30/70 silica sand), approximately five feet thick, may be placed above the filter pack. A bentonite seal, approximately five feet thick, will be placed above the filter pack (or fine sand, if used). The remaining annular space will be grouted with a bentonite-cement mixture, using approximately 7 to 8 gallons of water and approximately 5 pounds of bentonite per 94 pound bag of Type I or Type II Portland cement. The grout will be tremied into place from the top of the bentonite seal to ground surface. Monitoring wells will be completed with stick-up or flush-mount construction as determined by the site geologist based on the site conditions.

Soil samples for lithology will be collected starting at 5 feet bgs and at five-foot intervals to the total depth of the hole during hollow-stem auger drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch-long, 2-inch-or-larger-diameter split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID for potential volatile organic compounds. The monitoring wells will be drilled, installed, and developed as specified in Section 5.1 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in



the field by the on-site geologist, based on actual field conditions. After well development the monitoring well will be allowed to equilibrate 14 days prior to sample collection.

#### **4.2.4 Groundwater Sampling**

Groundwater samples will be collected from the four monitoring wells proposed at Former Range 41 and the Impact Area as presented in Section 4.2.3.

##### **4.2.4.1 Sample Locations and Rationale**

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationale is listed in Table 4-1. The groundwater sample designations, depths, required QA/QC sample quantities, and analytical parameters are listed in Table 4-3.

##### **4.2.4.2 Sample Collection**

Prior to sampling monitoring wells, static water levels will be measured from each of the monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 5.5 of the SAP (IT, 2002a). Groundwater samples will be collected in accordance with the procedures outlined in Section 6.1.1.5 and Attachment 5 of the SAP. Low-flow groundwater sampling methodology outlined in Attachment 5 of the SAP (IT, 2002a) may be used as deemed necessary by the IT Site Manager.

Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and are listed in Table 4-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

#### **4.2.5 Surface Water Sampling**

Three surface water samples will be collected from Former Range 41 and the Impact Area. The surface water samples will be collected from the intermittent streams as shown on Figure 4-1.

##### **4.2.5.1 Sample Locations and Rationale**

The surface water sampling rationale are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figure 4-1. The surface water sample designations and QA/QC sample requirements are listed in Table 4-4. The exact sampling locations will be

Table 4-3

**Groundwater Sample Designations and QA/QC Sample Quantities**  
**Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X**  
**Fort McClellan, Alabama**

Sample Location	Sample Designation	Sample Matrix *	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-95Q-MW01	HR-95Q-MW01-GW-QW3001-REG	Groundwater				TAL Metals, Nitroaromatic/Nitramine Explosives
HR-95Q-MW02	HR-95Q-MW02-GW-QW3002-REG	Groundwater	HR-95Q-MW02-GW-QW3003-FD		HR-95Q-MW02-GW-QW3002-MS/MSD	TAL Metals, Nitroaromatic/Nitramine Explosives TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides
HR-95Q-MW03	HR-95Q-MW03-GW-QW3004-REG	Groundwater				TAL Metals, Nitroaromatic/Nitramine Explosives
HR-131Q-MW01	HR-131Q-MW01-GW-QY3001-REG	Groundwater				TAL Metals, Nitroaromatic/Nitramine Explosives

a Groundwater samples will be collected from the approximate 5 to 10 feet of the water column per Attachment 5 of the SAP (IT, 2002a).

CI - Chlorinated.

FD - Field duplicate.

MS/MSD - Matrix spike/matrix spike duplicate.

OP - Organophosphorous.

QA/QC - Quality assurance/quality control.

REG - Field sample.

SVOC - Semivolatile organic compound.

TAL - Target analyte list.

TCL - Target compound list.

VOC - Volatile organic compound.

Table 4-4

**Surface Water and Sediment Sample Designations and QA/QC Sample Quantities  
Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X,  
Site Investigation  
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
HR-95Q-SW/SD01	HR-95Q-SW/SD01-SW-QW2001-REG	Surface Water	N/A				TAL Metals, Nitroaromatic/Nitramine Explosives TCL VOCs, TCL SVOCs, CI Pesticides, OP Pesticides, and CI Herbicides (TOC, Grain Size for sediment only)
	HR-95Q-SW/SD01-SD-QW1001-REG	Sediment	0-0.5	HR-95Q-SW/SD01-SD-QW1002-REG		HR-95Q-SW/SD01-SD-QW1001-MS/MSD	
HR-131Q-SW/SD01	HR-131Q-SW/SD01-SW-QY2001-REG	Surface Water	N/A				TAL Metals, Nitroaromatic/Nitramine Explosives (TOC, Grain Size for sediment only)
	HR-131Q-SW/SD01-SD-QY1001-REG	Sediment	0-0.5				
HR-131Q-SW/SD02	HR-131Q-SW/SD02-SW-QY2002-REG	Surface Water	N/A				TAL Metals, Nitroaromatic/Nitramine Explosives (TOC, Grain Size for sediment only)
	HR-131Q-SW/SD02-SD-QY1002-REG	Sediment	0-0.5				

CI - Chlorinated.  
FD - Field duplicate.  
MS/MSD - Matrix spike/matrix spike duplicate.  
NA - Not applicable.  
OP - Organophosphorous.  
QA/QC - Quality assurance/quality control.

REG - Field sample.  
SVOC - Semivolatile organic compound.  
TAL - Target analyte list.  
TCL - Target compound list.  
TOC - Total organic carbon.  
VOC - Volatile organic compound.

determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

#### **4.2.5.2 Sample Collection**

The surface water samples will be collected in accordance with the procedures specified in Section 6.1.1.3 of the SAP (IT, 2002a). Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

#### **4.2.6 Sediment Sampling**

Three sediment samples will be collected from Former Range 41 and the Impact Area. These sediment samples will be collected at the same locations as the surface water samples described in Section 4.2.5.

##### **4.2.6.1 Sample Locations and Rationale**

The proposed locations for the sediment samples are shown in Figure 4-1. Sediment sampling rationale are presented in Table 4-1. The sediment sample designation and QA/QC sample requirements are listed in Table 4-4. The actual sediment sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

##### **4.2.6.2 Sample Collection**

Sediment samples will be collected in accordance with the procedures specified in Section 6.1.1.2 of the SAP. Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP. The sediment samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

#### **4.2.7 Depositional Soil Sampling**

Two depositional soil samples will be collected from Former Range 41 and the Impact Area. The depositional soil samples will be collected from an intermittent drainage channel in the south central area of the site, which drains surface run-off from the cleared area and berm.

#### **4.2.7.1 Sample Locations and Rationale**

The proposed locations for the depositional soil samples are shown on Figure 4-1. Depositional soil sampling rationale are presented in Table 4-1. The depositional soil sample designation and QA/QC sample requirements are listed in Table 4-2. The actual depositional soil sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

#### **4.2.7.2 Sample Collection**

The depositional soil samples will be collected in accordance with the procedures for surface soil samples specified in Section 6.1.1.1 of the SAP. Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

### **4.3 Decontamination Requirements**

Decontamination will be performed on sampling and nonsampling equipment to prevent cross contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 6.5.1.1 of the SAP (IT, 2000a). Decontamination of non-sampling equipment will be performed in accordance with the requirements presented in Section 6.5.1.2 of the SAP.

### **4.4 Surveying of Sample Locations**

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary, to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

Horizontal coordinates for soil, sediment, and surface water sample locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for the horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or procedures to be used for GPS surveying

are described in Section 4.4.1.1 of the SAP (IT, 2002a). Conventional land survey requirements are presented in Section 4.4.1.2 of the SAP.

#### **4.5 Analytical Program**

Samples collected at locations specified in this chapter of this SFSP will be analyzed for the specific suites of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from Former Range 41 and the Impact Area consist of the following list of analytical suites:

- Target Analyte List Metals - EPA Method 6010B/7000
- Nitroaromatic and Nitramine Explosives - EPA Method 8330.

In addition, ten percent of the sample types will be analyzed for the following analytical parameters:

- Target Compound List Volatile Organic Compounds - EPA Method 5035/8260B
- Target Compound List Semivolatile Organic Compounds - EPA Method 8270C
- Chlorinated pesticides - EPA Method 8081A
- Chlorinated herbicides - EPA Method 8151A
- Organophosphorous pesticides - EPA Method 8141A.

In addition, sediment samples will be analyzed for the following parameters:

- Total Organic Carbon – EPA Method 9060
- Grain size – American Society for Testing Material D421/D422.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-5 in this SFSP and Chapter 5.0 in the QAP. Data will be reported and evaluated in accordance with definitive data requirements of Chapter 2, *Chemistry Data Reporting Requirements and Data Package Deliverables*, USACE Engineer Manual 200-1-6, *Chemical Quality Assurance Plan For Hazardous, Toxic and Radioactive Waste (HTRW) Projects* (USACE, 1997) and evaluated by the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

Table 4-5

**Analytical Samples  
Site Investigation  
Former Range 41, Parcel 95Q, and Impact Area, Choccolocco Corridor, Parcel 131Q-X  
Fort McClellan, Alabama**

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples <sup>a</sup>				EMAX
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis
Parcels 95Q and 131Q-X: 7 water matrix samples (4 groundwater and 3 surface water); 29 soil matrix samples (12 surface soil, 12 subsurface soil, 2 depositional soil, and 3 sediment samples)											
All samples will be analyzed for the following parameters:											
Explosives	8330	water	normal	7	1	7	1	1	0	1	11
TAL Metals	6010B/7000	water	normal	7	1	7	1	1	0	1	11
Explosives	8330	soil	normal	29	1	29	3	1	0	1	35
TAL Metals	6010B/7000	soil	normal	29	1	29	3	1	0	1	35
Approximately 10% of the sample types will be analyzed for the following parameters:											
TCL VOCs	8260B	water	normal	2	1	2	1	1	2	1	8
TCL SVOCs	8270C	water	normal	2	1	2	1	1	0	1	6
Chlorinated Pesticides	8081A	water	normal	2	1	2	1	1	0	1	6
Organophosphorous Pesticides	8141A	water	normal	2	1	2	1	1	0	1	6
Chlorinated Herbicides	8151A	water	normal	2	1	2	1	1	0	1	6
TCL VOCs	5035/8260B	soil	normal	4	1	4	1	3	0	1	12
TCL SVOCs	8270C	soil	normal	4	1	4	1	3	0	1	12
Chlorinated Pesticides	8081A	soil	normal	4	1	4	1	3	0	1	12
Organophosphorous Pesticides	8141A	soil	normal	4	1	4	1	3	0	1	12
Chlorinated Herbicides	8151A	soil	normal	4	1	4	1	3	0	1	12
Sediment samples will be analyzed for the following parameters:											
Total Organic Carbon	9060	sediment	normal	3	1	3	0	0	0	0	3
Grain size	D421/D422	sediment	normal	3	1	3	0	0	0	0	3
Parcels 95Q and 131Q-X Subtotal:						108	18	24	2	14	190

<sup>a</sup>Field duplicate and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.

Trip blank samples will be collected with water matrix samples for VOC analysis only. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

MS/MSD - Matrix spike/matrix spike duplicate.  
Explosives - Nitroaromatic and Nitramine.  
QA/QC - Quality assurance/quality control.  
SVOCs - Semivolatile organic compounds.

TAL - Target analyte list.  
TAT - Turn-around time.  
TCL - Target compound list.  
VOCs - Volatile organic compounds.

Ship samples to: EMAX Laboratories, Inc.  
1835 205th Street  
Torrance, CA 90501  
Attn: Elizabeth McIntyre  
Tel: 310-618-8889  
Fax: 310-618-0818

#### **4.6 Sample Preservation, Packaging, and Shipping**

Sample preservation, packaging, and shipping will follow the procedures specified in Sections 6.1.3 through 6.1.7 of the SAP (IT, 2002a). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre  
EMAX Laboratories, Inc.  
1835 205<sup>th</sup> Street  
Torrance, California 90501  
Telephone: (310) 618-8889.

#### **4.7 Investigation-Derived Waste Management**

Management and disposal of the investigation-derived waste (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2002a). The IDW expected to be generated at the Former Range 41 and the Impact Area will include decontamination fluids, drill cuttings, purge water from monitoring well development and sampling activities, and disposable personal protective equipment. Sampling of IDW to obtain analytical results for characterizing the waste for disposal will follow the procedures specified in Section 6.1.1.8 of the SAP (IT, 2002a).

#### **4.8 Site-Specific Safety and Health**

Health and safety requirements for this SI are provided in the SSHP attachment for Former Range 41 and the Impact Area. The SSHP attachment will be used in conjunction with the installation-wide safety and health plan, Appendix A of the SAP.



## **5.0 Project Schedule**

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The project schedule for the SI activities will be provided by the IT Project Manager to the Base Realignment and Closure Cleanup Team.

## 6.0 References

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IT Corporation (IT), 2002b, ***Draft Revision 3, Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, February.

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

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U.S. Army Corps of Engineers (USACE), 1999b, ***Statement of Work for Task Order CK10, Remedial Investigations (RIs) at the Chemical Warfare Material Sites, RIs at the Fuel/Training Areas, RIs at the Print Plants/Motor Pools, RIs at the Ground Scars/Boiler Plants, RI at Range 24A, Site investigations (SIs) at the Historic Ranges, and a Groundwater Investigation at Rideout Field at Fort McClellan, Alabama***, June.

U.S. Army Corps of Engineers (USACE), 1997, ***Engineer Manual 200-1-6, Chemical Quality Assurance For Hazardous, Toxic and Radioactive Waste (HTRW) Projects***.

U.S. Department of Agriculture, 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September.

U.S. Environmental Protection Agency (EPA), 2000, ***Guidance for the Data Quality Objectives Process***, EPA 600/R-96/005, August.

**ATTACHMENT 1**

**LIST OF ABBREVIATIONS AND ACRONYMS**

# List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
AB	ambient blank
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded
Abs	skin absorption
ABS	dermal absorption factor
AC	hydrogen cyanide
ACAD	AutoCadd
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
AdE	Anniston and Allen stony loam, 10 to 25 percent slope
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AET	adverse effect threshold
AF	soil-to-skin adherence factor
AHA	ammunition holding area
AL	Alabama
ALAD	-aminolevulinic acid dehydratase
amb.	Amber
amsl	above mean sea level
ANAD	Anniston Army Depot
AOC	area of concern
APEC	areas of potential ecological concern
APT	armor-piercing tracer
AR	analysis request
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all-terrain vehicle
AWARE	Associated Water and Air Resources Engineers, Inc.
AWWSB	Anniston Water Works and Sewer Board
‘B’	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor; bioconcentration factor

BCT	BRAC Cleanup Team
BERA	baseline ecological risk assessment
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIRTC	Branch Immaterial Replacement Training Center
bkg	background
bls	below land surface
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare; body weight
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CBR	chemical, biological and radiological
CCAL	continuing calibration
CCB	continuing calibration blank
CCV	continuing calibration verification
CD	compact disc
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CG	carbonyl chloride (phosgene)
CGI	combustible gas indicator
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity

Cl.	chlorinated
CLP	Contract Laboratory Program
cm	centimeter
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
Co-60	cobalt-60
CoA	Code of Alabama
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	chemical(s) of potential concern
COPEC	chemical(s) of potential ecological concern
CPSS	chemicals present in site samples
CQCSM	Contract Quality Control System Manager
CRDL	contract-required detection limit
CRL	certified reporting limit
CRQL	contract-required quantitation limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
CSM	conceptual site model
CT	central tendency
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
‘D’	duplicate; dilution
D&I	detection and identification
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DFTPP	decafluorotriphenylphosphine
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DM	dry matter
DMBA	dimethylbenz(a)anthracene
DMMP	dimethylmethylphosphonate

**List of Abbreviations and Acronyms** (Continued)

DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EB	equipment blank
EBS	environmental baseline survey
EC <sub>50</sub>	effects concentration for 50 percent of a population
ECBC	Edgewood Chemical/Biological Command
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EDQL	ecological data quality level
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EMI	Environmental Management Inc.
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
EPRI	Electrical Power Research Institute
ER	equipment rinsate
ERA	ecological risk assessment
ER-L	effects range-low
ER-M	effects range-medium
ESE	Environmental Science and Engineering, Inc.
ESMP	Endangered Species Management Plan
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
ET	exposure time
EU	exposure unit
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank

FD	field duplicate
FDA	U.S. Food and Drug Administration
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFS	focused feasibility study
FI	fraction of exposure
Fil	filtered
Flt	filtered
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
FOMRA	Former Ordnance Motor Repair Area
Foster Wheeler	Foster Wheeler Environmental Corporation
Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRRA	FTMC Reuse & Redevelopment Authority
g	gram
g/m <sup>3</sup>	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GAF	gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GCL	geosynthetic clay liner
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain

GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
Herb.	herbicides
HHRA	human health risk assessment
HI	hazard index
HPLC	high performance liquid chromatography
HNO <sub>3</sub>	nitric acid
HQ	hazard quotient
HQ <sub>screen</sub>	screening-level hazard quotient
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
‘I’	out of control, data rejected due to low recovery
IATA	International Air Transport Authority
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRDMIS	Installation Restoration Data Management Information System
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IS	internal standard
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System™

**List of Abbreviations and Acronyms (Continued)**

‘J’	estimated concentration	MMBtu/hr	million Btu per hour	NRCC	National Research Council of Canada
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	MOGAS	motor vehicle gasoline	NRHP	National Register of Historic Places
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	MP	Military Police	ns	nanosecond
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	MPA	methyl phosphonic acid	N-S	north to south
JPA	Joint Powers Authority	MPM	most probable munition	NS	not surveyed
K	conductivity	MQL	method quantitation limit	NSA	New South Associates, Inc.
K <sub>ow</sub>	octonal-water partition coefficient	MR	molasses residue	nT	nanotesla
L	lewisite; liter	MRL	method reporting limit	nT/m	nanoteslas per meter
l	liter	MS	matrix spike	NTU	nephelometric turbidity unit
LBP	lead-based paint	mS/cm	millisiemens per centimeter	nv	not validated
LC	liquid chromatography	mS/m	millisiemens per meter	O <sub>2</sub>	oxygen
LCS	laboratory control sample	MSD	matrix spike duplicate	O&G	oil and grease
LC <sub>50</sub>	lethal concentration for 50 percent population tested	MTBE	methyl tertiary butyl ether	O&M	operation and maintenance
LD <sub>50</sub>	lethal dose for 50 percent population tested	msl	mean sea level	OB/OD	open burning/open detonation
LEL	lower explosive limit	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded	OD	outside diameter
LOAEL	lowest-observed-advserse-effects-level	mV	millivolts	OE	ordnance and explosives
LT	less than the certified reporting limit	MW	monitoring well	oh	organic clays of medium to high plasticity
LUC	land-use control	MWI&P	Monitoring Well Installation and Management Plan	ol	organic silts and organic silty clays of low plasticity
LUCAP	land-use control assurance plan	Na	sodium	OP	organophosphorus
LUCIP	land-use control implementation plan	NA	not applicable; not available	ORP	oxidation-reduction potential
max	maximum	NAD	North American Datum	OSHA	Occupational Safety and Health Administration
MB	method blank	NAD83	North American Datum of 1983	OSWER	Office of Solid Waste and Emergency Response
MCL	maximum contaminant level	NAVD88	North American Vertical Datum of 1988	OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
MCLG	maximum contaminant level goal	NAS	National Academy of Sciences	OVS	oil/water separator
MCPA	4-chloro-2-methylphenoxyacetic acid	NCEA	National Center for Environmental Assessment	oz	ounce
MCS	media cleanup standard	NCP	National Contingency Plan	PA	preliminary assessment
MD	matrix duplicate	NCRP	National Council on Radiation Protection and Measurements	PAH	polynuclear aromatic hydrocarbon
MDC	maximum detected concentration	ND	not detected	PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
MDCC	maximum detected constituent concentration	NE	no evidence; northeast	Parsons	Parsons Engineering Science, Inc.
MDL	method detection limit	ne	not evaluated	Pb	lead
mg	milligrams	NEW	net explosive weight	PBMS	performance-based measurement system
mg/kg	milligrams per kilogram	NFA	No Further Action	PC	permeability coefficient
mg/kg/day	milligram per kilogram per day	NG	National Guard	PCB	polychlorinated biphenyl
mg/kgbw/day	milligrams per kilogram of body weight per day	NGP	National Guardsperson	PCDD	polychlorinated dibenzo-p-dioxins
mg/L	milligrams per liter	ng/L	nanograms per liter	PCDF	polychlorinated dibenzofurans
mg/m <sup>3</sup>	milligrams per cubic meter	NGVD	National Geodetic Vertical Datum	PCE	perchloroethene
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	Ni	nickel	PCP	pentachlorophenol
MHz	megahertz	NIC	notice of intended change	PDS	Personnel Decontamination Station
µg/g	micrograms per gram	NIOSH	National Institute for Occupational Safety and Health	PEF	particulate emission factor
µg/kg	micrograms per kilogram	NIST	National Institute of Standards and Technology	PEL	permissible exposure limit
µg/L	micrograms per liter	NLM	National Library of Medicine	PES	potential explosive site
µmhos/cm	micromhos per centimeter	NPDES	National Pollutant Discharge Elimination System	Pest.	pesticides
min	minimum	NPW	net present worth	PETN	pentarey thritol tetranitrate
MINICAMS	miniature continuous air monitoring system	No.	number	PFT	portable flamethrower
ml	inorganic silts and very fine sands	NOAA	National Oceanic and Atmospheric Administration	PG	professional geologist
mL	milliliter	NOAEL	no-observed-adverse-effects-level	PID	photoionization detector
mm	millimeter	NR	not requested; not recorded; no risk	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
MM	mounded material	NRC	National Research Council		

**List of Abbreviations and Acronyms** (Continued)

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PM	project manager	RTECS	Registry of Toxic Effects of Chemical Substances	STEL	short-term exposure limit
POC	point of contact	RTK	real-time kinematic	STL	Severn-Trent Laboratories
POL	petroleum, oils, and lubricants	SA	exposed skin surface area	STOLS	Surface Towed Ordnance Locator System®
POW	prisoner of war	SAD	South Atlantic Division	Std. units	standard units
PP	peristaltic pump; Proposed Plan	SAE	Society of Automotive Engineers	SU	standard unit
ppb	parts per billion	SAIC	Science Applications International Corporation	SUXOS	senior UXO supervisor
PPE	personal protective equipment	SAP	installation-wide sampling and analysis plan	SVOC	semivolatile organic compound
ppm	parts per million	sc	clayey sands; sand-clay mixtures	SW	surface water
PPMP	Print Plant Motor Pool	Sch.	Schedule	SW-846	U.S. EPA’s <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
ppt	parts per thousand	SCM	site conceptual model	SWMU	solid waste management unit
PR	potential risk	SD	sediment	SWPP	storm water pollution prevention plan
PRA	preliminary risk assessment	SDG	sample delivery group	SZ	support zone
PRG	preliminary remediation goal	SDZ	safe distance zone; surface danger zone	TAL	target analyte list
PSSC	potential site-specific chemical	SEMS	Southern Environmental Management & Specialties, Inc.	TAT	turn around time
pt	peat or other highly organic silts	SF	cancer slope factor	TB	trip blank
PVC	polyvinyl chloride	SFSP	site-specific field sampling plan	TBC	to be considered
QA	quality assurance	SGF	standard grade fuels	TCA	trichloroethane
QA/QC	quality assurance/quality control	SHP	installation-wide safety and health plan	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
QAM	quality assurance manual	SI	site investigation	TCDF	tetrachlorodibenzofurans
QAO	quality assurance officer	SINA	Special Interest Natural Area	TCE	trichloroethene
QAP	installation-wide quality assurance plan	SL	standing liquid	TCL	target compound list
QC	quality control	SLERA	screening-level ecological risk assessment	TCLP	toxicity characteristic leaching procedure
QST	QST Environmental, Inc.	sm	silty sands; sand-silt mixtures	TDEC	Tennessee Department of Environment and Conservation
qty	quantity	SM	Serratia marcescens	TDGCL	thiodiglycol
Qual	qualifier	SMDP	Scientific Management Decision Point	TDGCLA	thiodiglycol chloroacetic acid
‘R’	rejected data; resample	s/n	signal-to-noise ratio	TERC	Total Environmental Restoration Contract
R&A	relevant and appropriate	SOP	standard operating procedure	THI	target hazard index
RA	remedial action	SOPQAM	U.S. EPA’s <i>Standard Operating Procedure/Quality Assurance Manual</i>	TIC	tentatively identified compound
RAO	removal action objective	sp	poorly graded sands; gravelly sands	TLV	threshold limit value
RBC	risk-based concentration	SP	submersible pump	TN	Tennessee
RCRA	Resource Conservation and Recovery Act	SPCC	system performance calibration compound	TNT	trinitrotoluene
RD	remedial design	SPCS	State Plane Coordinate System	TOC	top of casing; total organic carbon
RDX	cyclonite	SPM	sample planning module	TPH	total petroleum hydrocarbons
ReB3	Rarden silty clay loams	SQRT	screening quick reference tables	TR	target cancer risk
REG	regular field sample	Sr-90	strontium-90	TRADOC	U.S. Army Training and Doctrine Command
REL	recommended exposure limit	SRA	streamlined human health risk assessment	TRPH	total recoverable petroleum hydrocarbons
RFA	request for analysis	SRM	standard reference material	TSCA	Toxic Substances Control Act
RfC	reference concentration	Ss	stony rough land, sandstone series	TSDF	treatment, storage, and disposal facility
RfD	reference dose	SS	surface soil	TWA	time-weighted average
RGO	remedial goal option	SSC	site-specific chemical	UCL	upper confidence limit
RI	remedial investigation	SSHO	site safety and health officer	UCR	upper certified range
RL	reporting limit	SSHP	site-specific safety and health plan	‘U’	not detected above reporting limit
RME	reasonable maximum exposure	SSL	soil screening level	UF	uncertainty factor
ROD	Record of Decision	SSSL	site-specific screening level	USACE	U.S. Army Corps of Engineers
RPD	relative percent difference	SSSSL	site-specific soil screening level	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
RRF	relative response factor	STB	supertropical bleach	USAEC	U.S. Army Environmental Center
RSD	relative standard deviation	STC	source-term concentration	USAEHA	U.S. Army Environmental Hygiene Agency
RTC	Recruiting Training Center	STD	standard deviation	USACMLS	U.S. Army Chemical School

**List of Abbreviations and Acronyms** (Continued)

USAMPS	U.S. Army Military Police School
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women’s Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd <sup>3</sup>	cubic yards

- S – Non-target compound analyzed for and detected (GC/MS methods)
- T – Non-target compound analyzed for but not detected (non GC/MS methods)
- U – Analysis in unconfirmed
- Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

- J – The low-spike recovery is low
- N – The high-spike recovery is low
- R – Data is rejected

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

- LT – Less than the certified reporting limit

Flagging Codes

- 9 – Non-demonstrated/validated method performed for USAEC
- B – Analyte found in the method blank or QC blank
- C – Analysis was confirmed
- D – Duplicate analysis
- I – Interfaces in sample make quantitation and/or identification to be suspicious
- J – Value is estimated
- K – Reported results are affected by interfaces or high background
- N – Tentatively identified compound (match greater than 70%)
- Q – Sample interference obscured peak of interest
- R – Non-target compound analyzed for but not detected (GC/MS methods)